Advanced Laboratory

Wubben Science 218
MW 3:00 – 4:50 pm

Instructor	Dr. Brian Hosterman
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Office	Wubben Science 228C
Office Hours	MTWRF 9:00 – 9:50 am
	TF 3:00-3:50 pm

Prerequisite
PHYS 252 Intermediate Laboratory.

Required Text and Supplies
Quad-ruled laboratory notebook (any brand will do).

Course Overview
Physics is largely driven by experimental discoveries and observations. As physics has evolved, these experiments have become increasingly sophisticated in terms of the concepts involved, equipment used, measurement techniques, and data analysis. This course aims to provide a stepping stone between introductory-level physics experiments and professional experimental physics. This includes training in error analysis and presentation of experimental results via formal reports and presentations.

Course Learning Objectives
Upon completion of this course, a student should be able to:

1. Use a variety of laboratory equipment.
2. Design, execute, and troubleshoot experiments.
3. Apply error analysis and error propagation.
4. Analyze experimental data.
5. Keep a well-documented laboratory journal.
6. Produce scientific reports in the style of scientific journal articles.
7. Present experimental results to an audience via oral presentation.

Grade Distribution and Grading Scale
Your grade for this course is based on the following activities, weighted as shown.

Attendance / Literature Search	10%
Lab Journal	30%
Three Lab Reports	40%
Two Oral Presentations	20%

All graded work will be assigned a numerical score. Your letter grade can be estimated by calculating a percentage score and referencing the table below.

≥ 89.50	A
79.50 – 89.49	B
69.50 – 79.49	C
59.50 – 69.49	D
≤ 59.99	F

Attendance and Literature Search Policy
Experiments are never finished! There is always something that can be measured again, fixed, or improved upon in experimental physics. For each class meeting that you are present and briefly present a new journal article relating to the experiment you are currently working on, you will earn 1 point. If you are absent, or fail to present an article that is different than any articles already presented in class by you or your peers, you will not receive the daily attendance point. To earn the attendance point, you must be present for the entire class period.

Laboratory Journal
You must keep a laboratory journal where you will describe, in detail, your work and progress on *all* laboratory activities. The purpose of such a journal is to be detailed enough that an outsider could recreate your experiment from only your journal. You will receive a separate grade, out of 10 points, every three weeks for the current progress of your journal. Do *not* lose your lab journal! Your laboratory journal will be graded according to a rubric, which will be provided as a separate document.

Laboratory Reports
There will be five formal laboratory reports due on selected labs. You will be required to turn in two drafts for each of these, that will be graded and for which feedback will be given. These laboratory reports must contain, in this order:

1. Title
2. Abstract, in which the experiment and results are described briefly
3. Description of the context of the experiment and the theory which underlies it
4. Description of the apparatus and the measurements performed
5. Data and discussion, including data and error analysis and interpretation of the data
6. Conclusion, including implications of the experiment

Late Work
Lab report drafts will be collected at the beginning of class period of the due date. Lab journals will be collected at the end of the class period on days that the journals are to be collected and graded. These graded assignments will be deducted 1 point or 10%, whichever is greater, of the total point value of the assignment if not turned in at this time, plus an additional 1 point or 10%, whichever is greater, for every 24 hours thereafter.

Oral Presentations
You will be required to give two oral presentations to the class on selected labs you perform this semester. The presentations will be on the same topic, with the first being a practice talk for the

final presentation. The talks should be 20-25 minutes long and aimed at a audience of sophomore-level physics majors.

Course Expectations
This course will require a fair amount of independent study (i.e. text reading and homework problems). Expect to spend a minimum of two hours outside of the classroom for every hour in the classroom.

Course Correspondence
All communication in this course will be made via your CMU email account. Please include the title of the course and section number in the subject line (PHYS 331). Check your email regularly throughout the semester. I will respond to your emails within 48 hours.

Disclaimer
The professor reserves the right to change any aspect of this syllabus at any time as fairness and circumstances dicate. An updated syllabus can always be found via D2L.

Tentative Course Schedule

The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the daily reading and problem assignments. The reading and homework problems need to be completed for the class day they are listed! An updated calendar can be located on D2L.

Monday	Wednesday
Jan 21st Martin Luther King, Jr. Day No Class	23rd **1**
28th **2**	30th **3**
Feb 4th **4**	6th **5** Lab journal collected
11th **6**	13th **7**
18th **8**	20th **9** Lab report 1 (first draft) due
25th **10**	27th **11** Lab journal collected
Mar 4th **12**	6th **13** Lab report 1 (second draft) due
11th **14**	13th **15** Lab report 1 (final draft) due

Monday	Wednesday
18th Spring Break No Class	20th Spring Break No Class
25th **16**	27th **17** Lab report 2 (first draft) due Lab journal collected
Apr 1st **18**	3rd **19**
8th **20**	10th **21** Lab report 2 (second draft) due
15th **22**	17th **23** Lab report 2 (final draft) due Lab journal collected
22nd **24**	24th **25** Lab report 3 (first draft) due
29th **26**	May 1st **27**
6th **28**	8th **29** Lab report 3 (second draft) due Final Presentations
13th	15th **Final Presentations** Lab journal collected Lab report 3 (final draft) due 3:00 – 4:50 pm